Literature Review – Disincentives to Organics Disposal in Landfills (DRAFT)

There are four methods, generally, to discourage the disposal of organic materials in landfills. Policies fall into the following categories: monetary disincentives or non-monetary disincentives. Within these there are compensatory policies and penalties policies i.e., the proverbial carrot or stick.

Examples	Rewards	Penalties
Monetary	Fee discount or incentive payment	Fines
Non-monetary	Organizational recognition, training, or sponsorships	Permit withheld until corrective action is taken

Understanding economic, social, legal, political, technological, and geographic issues impacting organic waste management is key to developing functional and adaptive model ordinances. An analysis of ten peer-reviewed articles provides insights regarding disincentives to organics disposal in landfills in the U.S. and abroad. Articles are listed alphabetically by last name of the primary author.

Agamuthu, P., Babel, S. (2023) <u>Waste management developments in the last five decades: Asian perspective</u>, Waste Management & Research 1–18
"Solid waste management was explored in Asia's last five decades, and the issues and challenges were identified. Waste generation has increased in all nations in the previous 50 years, although more recently, a declining trend has been observed in Japan and Korea. The composition has been predominantly organic, with 45–50% being kitchen waste. Material extraction and productivity to sustain the most populous part of the globe are explained. Waste management technologies have evolved, with more nations slowly transitioning from landfills to using waste-to-energy options. However, landfilling and open dumps are still the major disposal choice in most developing countries in Asia. Thus, the issues of concern include dumpsites management, the informal sector, waste collection, open burning and food waste. Changes (increasing trends) in the recycling technologies and quantum are evident, as seen in several country reports from India, Indonesia, Japan, Malaysia, Singapore, South Korea, Thailand and Vietnam, (Agamuthu, Babel 2023)."

Chalak, A., Abou-Daher, C., Chaaban, J., Abiad, M. G. (2016) <u>The global economic and regulatory determinants of household food waste generation: A cross-country analysis</u> Volume 48, Pages 418-422
"Food is generally wasted all along the supply chain, with an estimated loss of 35 percent generated at the consumer level. Consequently, household food waste constitutes a sizable proportion of the total waste generated throughout the food supply chain. Yet such wastes vary drastically between developed and developing countries. Using data collected from 44 countries with various income levels, this paper investigates the impact of legislation and economic incentives on household food waste generation. The obtained results indicate that well-defined regulations, policies and strategies are more effective than fiscal measures in mitigating household food waste generation, (Chalak, Abou-Daher, Chaaban, Abiad, 2016)."

Elliot, A. (2008). Is Composting Organic Waste Spreading. EnviroStats, 2(1), 8-12
"When asked what they do for the environment, many people say they recycle, reducing the amount of garbage they put in the trash. Composting organic wastes is another way of reducing the amount of waste being sent to landfill. Traditionally, households composted in the backyard, but the use of municipal compost collection systems is growing. In the last few years a number of programs for curbside collection of food wastes have been initiated in large cities such as Edmonton, Toronto, Hamilton and Ottawa. The diversion of organic waste has become a growing trend. From 2000 to 2004, the amount of organic waste composted by the waste management industry increased by 70% to 1.7 million tonnes. Close to two thirds of these organic wastes were generated by the residential sector. Although the majority of households that compost do so in their backyard, access to curbside collection of organic wastes plays an important role in people's participation in composting (Elliot 2008)."

Ryen, E. G., Babbitt, C. W. (2022) The role of U.S. policy in advancing circular economy solutions for wasted food, Journal of Cleaner Production, Volume 369
"Food waste is a growing global sustainability challenge. The United States plays a major role in food waste generation and yet has seen limited progress toward significantly reducing the amount of food ultimately being landfilled. Circular economy offers a compelling alternative to the current linear management of food and food waste, but the U.S. also lacks comprehensive public policy that would enable circular economy in the food system. This article provides a systemic analysis of U.S. federal and state policy to identify whether current regulations and initiatives are helping or hindering circular food waste management. One key finding is that the U.S. has ambitious national goals and initiatives aimed at reducing and recovering wasted food, but these efforts are voluntary and lack enforcement mechanisms. Individual states have enacted a wide array of policies expected to both directly and indirectly influence wasted food generation and management, including highly variable requirements for food date labeling and using excess food as animal feed. The majority of U.S. states have policies in place that would support donation of excess food for human use, and a few actually mandate wasted food management through landfill bans or diversion targets. However, the heterogeneity inherent to the observed "patchwork" of state policies is expected to confound broader circular economy goals and potentially limit new business models and stakeholder participation. Therefore, high priorities for policy efforts include federal standardization of date labeling and regional harmonization of state rescue and redistribution policies to support efficient business implementation and compliance (Ryen, Babbitt 2022)."

Harrington, W, Morganstern, R.D., (Fall Winter 2004) Economic Incentives versus Command and Control – What's the Best Approach for Solving Environmental Problems?, Resources for the Future
"Winston Harrington and Richard D. Morgenstern Now, decades after the first environmental laws were passed in this country, policymakers face many choices when seeking to solve environmental problems. Will taxing polluters for their discharges be more effective than fining them for not meeting certain emissions standards? Will a regulatory agency find it less costly to enforce a ban or oversee a system of tradable permits? Which strategy will reduce a pollutant the quickest? Clearly, there are no "one-size-fits-all" answers. Many factors enter into the decision to favor either policy that lean more toward economic incentives (EI) and toward direct regulation, commonly referred to as command-and-control (CAC) policy. Underlying determinants include a country's governmental and regulatory infrastructure, along with the nature of the environmental problem itself. Even with these contextual factors to consider, we thought it would be useful to compare EI and CAC policies and their outcomes in a real-world setting. To do this, we looked at six environmental problems that the United States and

at least one European country dealt with differently. For each problem, one approach was more of an EI measure, while the other relied more on CAC. For example, to reduce point-source industrial water pollution, the Netherlands implemented a system of fees for organic pollutants (EI), while the United States established a system of guidelines and permits (CAC). It turned out, in fact, that most policies had at least some elements of both approaches, but we categorized them as EI or CAC based on their dominant features. We then asked researchers who had previously studied these policies on either side of the Atlantic to update or prepare new case studies. We analyzed the 12 case studies (two for each of the six environmental problems) against a list of hypotheses frequently made for or against EI and CAC, such as which instrument is more effective or imposes less administrative burden. (Harrington, Morganstern 2004)."

Priefer, C., Jörissen, J., Bräutigam, K., (2016) <u>Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action,</u> Resources, Conservation and Recycling, Volume 109. Pages 155-165
"The reduction of food waste is seen as an important lever for ensuring food security and diminishing environmental burdens. In context of the forthcoming revision of the European Waste Directive the EC is planning to commit its Member States to reduce their food waste by 30% until 2025. To reach this ambitious objective effective prevention measures have to be implemented. This requires detailed knowledge on drivers and reasons for food waste generation along the food supply chain and the 'hotspots of wastage'. The paper provides information on these two topics. Main drivers for food waste generation are process- and market-based standards, non-compliance with food safety requirements, exceeding of expiry dates, marketing standards or logistic constraints, but also consumer preferences and societal trends like growing prosperity, declining food prices, rising number of single households and increasing employment of women. As surveys and calculations indicate, the highest waste rates in Europe occur at the first stage (primary production) and the last stage (household sector) of the supply chain. The paper further presents a set of policy options on European and national level which are considered most promising to prevent food waste. The selection is based on a thorough literature review, reflecting also the results of a stakeholder workshop held in November 2014. The analysis reveals that most of the prevention measures implemented in the EU Member States up to now are soft instruments like awareness campaigns, round tables, networks and information platforms. In addition to this soft instruments, the paper advocates for the introduction of more rigorous approaches like the abolishment of subsidies on food, amendments to EU regulations and economic incentives. Further research is required to assess the impacts and efficacy of economic and regulatory instruments (Priefer, Jörissen, Bräutigam 2016)."

Sanders, Robert Evan, (May 2020) <u>Dynamic Pricing and Organic Waste Bans: A Study of Grocery Retailers' Incentives to Reduce Food Waste</u> University of California, San Diego (UCSD) - Rady School of Management
"I analyze the welfare effects of two potential solutions to grocery-retail food waste: dynamic pricing and organic waste landfill bans. I use a structural econometric model with sales, perishability, and marginal cost data from a grocery chain's artisanal bread category. My analysis of these counterfactuals shows that dynamic pricing Pareto-dominates an organic waste ban: Dynamic pricing reduces waste by 21% while increasing the chain's gross margins and consumer surplus by 3% and 0.3%, respectively. In contrast, an organic waste ban, simulated by a ten-fold increase in disposal costs, reduces waste by only 4% and decreases profits and consumer surplus. Therefore, if regulators want to reduce grocery-store waste, they should incentivize chains to adopt dynamic pricing over imposing organic waste bans. (Sanders 2020)."

Schuyler, Q., Hardesty, B.D., Lawson, TJ, Opie, K., Wilcox, C. (2018) Economic incentives reduce plastic inputs to the ocean, Marine Policy, Volume 96, Pages 250-255
"Mismanaged waste and marine debris have significant detrimental effects on wildlife, public health, and the economy. Container deposit legislation (CDL) is one of the many legislative actions proposed by lawmakers to curb the amount of debris entering the ocean. Beverage containers are consistently among the most commonly littered items, so effective legislation could prove a significant lever to reduce debris inputs to the marine environment. The effectiveness of CDL at reducing the amount of beverage container litter on the coasts of two countries, Australia and the United States, was evaluated by comparing results of debris surveys in states with and without cash incentives for returned beverage containers. The proportion of containers found in coastal debris surveys in states with CDL was approximately 40% lower than in states without CDL. Additionally, CDL states had a higher ratio of lids to bottles, further demonstrating the effectiveness of the incentives in removing bottles from the waste stream. The reduction in beverage containers in the presence of CDL was greater in areas with low socio-economic status, where debris loads are highest. These results provide strong evidence that fewer beverage containers end up as mismanaged coastal waste in states that provide a cash refund for returned beverage containers. Findings are discussed in the context of global governance, social license and opportunities to reduce land-based litter inputs to the ocean, (Schuyler, Hardesty, Lawson, Opie, Wilcox 2018)."

Vanderkloet, R. (2023). Organic Waste Diversion in Atlantic Canada, Institute of the Environment, University of Ottawa
"Sustainable waste management is essential for reducing greenhouse gas emissions, conserving landfill space, and producing valuable end-products. Organic waste diversion plays an important role in sustainable waste management with various environmental and economic benefits. Organic waste diversion is not a new concept, and many areas have had systems in place for over 20 years. One area where there are significant variations in residential organics waste diversion rates is Atlantic Canada. This research paper investigates the factors that contribute to these variations and explores the barriers and opportunities for increasing diversion across the region. Through a comprehensive literature review, the study investigates several factors that may affect diversion rates, including population density, access to composting facilities, curbside collection, and public education and outreach programs. The paper explores unique challenges in organics waste diversion in rural areas of Atlantic Canada due to limited access to resources and infrastructure. The study also highlights various opportunities for progress, such as increased funding for diversion programs and more data collection and reporting on waste management. Overall, this research paper provides insights for policymakers and practitioners looking to improve diversion rates and advance sustainable waste management practices in Atlantic Canada (Vanderkloet 2023)."

Velenturf, A. P. M., Purnell, P. (2021). Principles for a sustainable circular economy. Sustainable Production and Consumption, 27, 1437–1457
"The pressure that the human species exerts on the natural environment through the extraction of materials and generation of wastes is widely recognised. Circular economy has emerged as a potential solution to make better use of resources. Positioned as a technology-focused concept that can generate economic gains while alleviating pressure on the environment, circular economy enjoys a positive reception by organisations in public, private and civic sectors and, increasingly, academia alike. However, concerns have been raised regarding some purported circular economy practices being promoted as 'sustainable' yet resulting in detrimental impacts on environment and society. We briefly revisit the systems ecology literature that construed the context for both circular economy and sustainable development. Values and principles in core sustainable development literature are

analysed to offer a foundation against which circular economy can be discussed. We then analyse and critically reflect upon the strengths, shortcomings and theoretical flaws within the values and principles that emerged from the evolving circular economy literature. We propose a value framework and set of ten principles for the design, implementation, and evaluation of a sustainable circular economy. We finish with a call for action for both practitioners and a research agenda for academia, (Velenturf, Purnell 2021)."